

What is claimed is:

1 1. A method for acquiring a received spread spectrum signal,
2 the received signal having a carrier component at a carrier
3 frequency, a code component having a code period, and a data
4 component, the acquiring including matching the phase of a
5 replica of the code component to the phase of the received code
6 component and also determining any shift in the carrier
7 frequency away from a transmitted carrier frequency, the method
8 comprising the steps of:

9 a) performing a first acquisition of the received signal so as
10 to provide an approximately estimated carrier frequency and
11 a phase of the replica and also so as to provide a code-
12 wiped and an approximately carrier-wiped signal; and

13 b) performing a second acquisition of the approximately
14 carrier-wiped signal, the second acquisition including a
15 substep of data wipe-off involving a squaring or similar
16 operation on a signal derived from the approximately
17 carrier-wiped signal;

18 thereby providing a correction to the approximately estimated
19 carrier frequency, a correction that accounts for the carrier
20 frequency shift remaining after the first acquisition.

1 2. A method as claimed in claim 1, wherein the step of
2 performing a second acquisition of the approximately carrier-
3 wiped signal comprises the substeps of:

4 a) mixing the approximately carrier-wiped signal with a
5 plurality of sinusoids in turn, each sinusoid at a
6 different frequency in a range of frequencies serving as
7 trial corrections to the approximately estimated carrier

8 frequency determined in the step of performing a first
9 acquisition, so as to provide a mixed signal;

10 b) performing a first coherent processing of the mixed signal
11 so as to provide a carrier-amplified signal;

12 c) performing a data wipeoff using the carrier-amplified
13 signal so as to provide a data-wiped signal, the data
14 wipeoff including a squaring or similar operation on the
15 carrier-amplified signal, thus retaining in the data-wiped
16 signal, information about the carrier frequency shift
17 remaining after the first acquisition;

18 d) performing a second coherent processing of the data-wiped
19 signal, the second coherent processing for providing a
20 further correlated and filtered signal; and

21 e) detecting the best value to use for the correction to the
22 approximately estimated carrier frequency based on the
23 further correlated and filtered signal for each different
24 trial frequency correction.

1 3. A method as claimed in claim 2, wherein the first coherent
2 processing comprises a lowpass filtering and a downsampling, and
3 the second coherent processing comprises a coherent
4 accumulation.

1 4. A method as claimed in claim 2, wherein the first coherent
2 processing comprises an integrate and dump processing followed
3 by a filtering, and the second coherent processing comprises a
4 coherent accumulation.

1 5. A method as claimed in claim 2, wherein the first coherent
2 processing comprises a discrete Fourier transform (DFT)
3 processing using zero padding and output pruning, and the second

coherent processing comprises a coherent accumulation.

6. A method as claimed in claim 1, wherein the step of performing a second acquisition of the approximately carrier-wiped signal comprises the substeps of:

- a) performing a first coherent processing of the approximately carrier-wiped signal so as to provide a carrier-amplified signal;
- b) performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency shift remaining after the first acquisition; and
- c) performing a mixing and second coherent processing, the mixing being performed on the data-wiped signal using a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial corrections to the approximately estimated carrier frequency determined in the step of performing a first acquisition, to provide a mixed and data-wiped signal, and the second coherent processing being performed on the mixed and data-wiped signal, the second coherent processing for providing a further correlated and filtered signal.

7. A method as claimed in claim 6, wherein in the step of performing a mixing and second coherent processing, the coherent processing includes a discrete Fourier transform of the mixed and data-wiped signal followed by an accumulation.

8. A method as claimed in claim 1, wherein the step of

performing a second acquisition of the approximately carrier-wiped signal comprises the substeps of:

- a) performing a first coherent processing of the approximately carrier-wiped signal so as to provide a carrier-amplified signal;
- b) performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency shift remaining after the first acquisition; and
- c) performing a cross correlation of the data-wiped signal, the cross correlation including estimating the phase and then the correction to the approximately estimated carrier frequency.

9. A method as claimed in claim 1, wherein the step of performing a second acquisition of the approximately carrier-wiped signal comprises the substeps of:

- a) performing a common coherent processing of the approximately carrier-wiped signal so as to provide a first-processed approximately carrier-wiped signal;
- b) mixing the first-processed approximately carrier-wiped signal with a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial corrections to the approximately estimated carrier frequency determined in the step of performing a first acquisition, so as to provide a mixed signal;
- c) performing a first coherent channel processing of the mixed signal so as to provide a carrier-amplified signal;

- 15 d) performing a data wipeoff using the carrier-amplified
16 signal so as to provide a data-wiped signal, the data
17 wipeoff including a squaring or similar operation on the
18 carrier-amplified signal, thus retaining in the data-wiped
19 signal, information about the carrier frequency shift
20 remaining after the first acquisition;
- 21 e) performing a second coherent channel processing on the
22 data-wiped signal, the second coherent processing for
23 providing a further correlated and filtered signal; and
- 24 f) detecting the best value to use for the correction to the
25 approximately estimated carrier frequency based on the
26 further correlated and filtered signal for each different
27 trial frequency correction.

1 10. A method as claimed in claim 1, wherein the first
2 acquisition is a coarse acquisition, and the second acquisition
3 is a fine acquisition.

4 11. A method as claimed in claim 1, wherein the squaring is a
5 complex squaring.

6 12. An apparatus for acquiring a received spread spectrum
7 signal, the received signal having a carrier component at a
8 carrier frequency, a code component having a code period, and a
9 data component, the acquiring including matching the phase of a
10 replica of the code component to the phase of the received code
11 component and also determining any shift in the carrier
12 frequency away from a transmitted carrier frequency, the
13 apparatus comprising:

- 14 a) means for performing a first acquisition of the received
15 signal so as to provide an approximately estimated carrier

frequency and a phase of the replica and also so as to provide a code-wiped and an approximately carrier-wiped signal; and

- b) means for performing a second acquisition of the approximately carrier-wiped signal, the second acquisition including means for performing a data wipe-off involving a squaring or similar operation on a signal derived from the approximately carrier-wiped signal;

thereby providing a correction to the approximately estimated carrier frequency, a correction that accounts for the carrier frequency shift remaining after the first acquisition.

13. An apparatus as claimed in claim 12, wherein the means for performing a second acquisition of the approximately carrier-wiped signal comprises:

- a) means for mixing the approximately carrier-wiped signal with a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial corrections to the approximately estimated carrier frequency determined using the means for performing a first acquisition, so as to provide a mixed signal;
- b) means for performing a first coherent processing of the mixed signal so as to provide a carrier-amplified signal;
- c) means for performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency shift remaining after the first acquisition;

- 18 d) means for performing a second coherent processing of the
19 data-wiped signal, the second coherent processing for
20 providing a further correlated and filtered signal; and
21 e) means for detecting the best value to use for the
22 correction to the approximately estimated carrier frequency
23 based on the further correlated and filtered signal for
24 each different trial frequency correction.

1 14. An apparatus as claimed in claim 13, wherein the means for
2 performing a first coherent processing comprises a lowpass
3 filter and a downsampler, and the means for performing a second
4 coherent processing comprises a coherent accumulator.

1 15. An apparatus as claimed in claim 13, wherein the means for
2 performing a first coherent processing comprises an integrate
3 and dump module followed by a filter, and the means for
4 performing a second coherent processing comprises a coherent
5 accumulator.

1 16. An apparatus as claimed in claim 13, wherein the means for
2 performing a first coherent processing comprises a discrete
3 Fourier transform (DFT) module using zero padding and output
4 pruning, and the means for performing a second coherent
5 processing comprises a coherent accumulator.

1 17. An apparatus as claimed in claim 12, wherein the means for
2 performing a second acquisition of the approximately carrier-
3 wiped signal comprises:

- 4 a) means for performing a first coherent processing of the
5 approximately carrier-wiped signal so as to provide a
6 carrier-amplified signal;

- 7 b) means for performing a data wipeoff using the carrier-
8 amplified signal so as to provide a data-wiped signal, the
9 data wipeoff including a squaring or similar operation on
10 the carrier-amplified signal, thus retaining in the data-
11 wiped signal, information about the carrier frequency shift
12 remaining after the first acquisition; and
- 13 c) means for performing a mixing and second coherent
14 processing, the mixing being performed on the data-wiped
15 signal using a plurality of sinusoids in turn, each
16 sinusoid at a different frequency in a range of frequencies
17 serving as trial corrections to the approximately estimated
18 carrier frequency determined by the means for performing a
19 first acquisition, to provide a mixed and data-wiped
20 signal, and the second coherent processing being performed
21 on the mixed and data-wiped signal, the second coherent
22 processing for providing a further correlated and filtered
23 signal.

1 18. An apparatus as claimed in claim 17, wherein the means for
2 performing a mixing and second coherent processing includes a
3 means for performing a discrete Fourier transform of the mixed
4 and data-wiped signal followed by an accumulator.

1 19. An apparatus as claimed in claim 12, wherein the means for
2 performing a second acquisition of the approximately carrier-
3 wiped signal comprises:

- 4 a) means for performing a first coherent processing of the
5 approximately carrier-wiped signal so as to provide a
6 carrier-amplified signal;
- 7 b) means for performing a data wipeoff using the carrier-
8 amplified signal so as to provide a data-wiped signal, the

9 data wipeoff including a squaring or similar operation on
10 the carrier-amplified signal, thus retaining in the data-
11 wiped signal, information about the carrier frequency shift
12 remaining after the first acquisition; and

- 13 c) means for performing a cross correlation of the data-wiped
14 signal, the cross correlation including estimating the
15 phase and then the correction to the approximately
16 estimated carrier frequency.

1 20. An apparatus as claimed in claim 12, wherein the means for
2 performing a second acquisition of the approximately carrier-
3 wiped signal comprises:

- 4 a) means for performing a common coherent processing of the
5 approximately carrier-wiped signal so as to provide a
6 first-processed approximately carrier-wiped signal;
7 b) means for mixing the first-processed approximately carrier-
8 wiped signal with a plurality of sinusoids in turn, each
9 sinusoid at a different frequency in a range of frequencies
10 serving as trial corrections to the approximately estimated
11 carrier frequency determined using the means for performing
12 a first acquisition, so as to provide a mixed signal;
13 c) means for performing a first coherent channel processing of
14 the mixed signal so as to provide a carrier-amplified
15 signal;
16 d) means for performing a data wipeoff using the carrier-
17 amplified signal so as to provide a data-wiped signal, the
18 data wipeoff including a squaring or similar operation on
19 the carrier-amplified signal, thus retaining in the data-
20 wiped signal, information about the carrier frequency shift
21 remaining after the first acquisition;

22 e) means for performing a second coherent channel processing
23 on the data-wiped signal, the second coherent processing
24 for providing a further correlated and filtered signal; and
25 f) means for detecting the best value to use for the
26 correction to the approximately estimated carrier frequency
27 based on the further correlated and filtered signal for
28 each different trial frequency correction.

1 21. An apparatus as claimed in claim 12, wherein the first
2 acquisition is a coarse acquisition, and the second acquisition
3 is a fine acquisition.

4 22. An apparatus as claimed in claim 12, wherein the squaring
5 is a complex squaring.

6 23. A system for acquiring a spread spectrum signal, the signal
7 having a carrier component at a carrier frequency, a code
8 component having a code period, and a data component, the
9 acquiring including matching the phase of a replica of the code
10 component to the phase of the code component and also
11 determining any shift in the carrier frequency away from a
12 transmitted carrier frequency, the apparatus comprising:

13 a) a receiver, for receiving the spread spectrum signal as a
14 sequence of samples, for providing a received signal;
15 b) means for performing a first acquisition of the received
16 signal so as to provide an approximately estimated carrier
frequency and a phase of the replica and also so as to
provide a code-wiped and an approximately carrier-wiped
signal; and
c) means for performing a second acquisition of the
approximately carrier-wiped signal, the second acquisition

including means for performing a data wipe-off involving a squaring or similar operation on a signal derived from the approximately carrier-wiped signal;

thereby providing a correction to the approximately estimated carrier frequency, a correction that accounts for the carrier frequency shift remaining after the first acquisition.

24. A system as claimed in claim 23, wherein the means for performing a second acquisition of the approximately carrier-wiped signal comprises:

- a) means for mixing the approximately carrier-wiped signal with a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial corrections to the approximately estimated carrier frequency determined using the means for performing a first acquisition, so as to provide a mixed signal;
- b) means for performing a first coherent processing of the mixed signal so as to provide a carrier-amplified signal;
- c) means for performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency shift remaining after the first acquisition;
- d) means for performing a second coherent processing of the data-wiped signal, the second coherent processing for providing a further correlated and filtered signal; and
- e) means for detecting the best value to use for the correction to the approximately estimated carrier frequency based on the further correlated and filtered signal for each different trial frequency correction.

1 25. A system as claimed in claim 24, wherein the means for
2 performing a first coherent processing comprises a lowpass
3 filter and a downsampler, and the means for performing a second
4 coherent processing comprises a coherent accumulator.

1 26. A system as claimed in claim 24, wherein the means for
2 performing a first coherent processing comprises an integrate
3 and dump module followed by a filter, and the means for
4 performing a second coherent processing comprises a coherent
5 accumulator.

1 27. A system as claimed in claim 24, wherein the means for
2 performing a first coherent processing comprises a discrete
3 Fourier transform (DFT) module using zero padding and output
4 pruning, and the means for performing a second coherent
5 processing comprises a coherent accumulator.

1 28. A system as claimed in claim 23, wherein the means for
2 performing a second acquisition of the approximately carrier-
3 wiped signal comprises:

- 4 a) means for performing a first coherent processing of the
5 approximately carrier-wiped signal so as to provide a
6 carrier-amplified signal;
- 7 b) means for performing a data wipeoff using the carrier-
8 amplified signal so as to provide a data-wiped signal, the
9 data wipeoff including a squaring or similar operation on
10 the carrier-amplified signal, thus retaining in the data-
11 wiped signal, information about the carrier frequency shift
12 remaining after the first acquisition; and

13 c) means for performing a mixing and second coherent
14 processing, the mixing being performed on the data-wiped
15 signal using a plurality of sinusoids in turn, each
16 sinusoid at a different frequency in a range of frequencies
17 serving as trial corrections to the approximately estimated
18 carrier frequency determined by the means for performing a
19 first acquisition, to provide a mixed and data-wiped
20 signal, and the second coherent processing being performed
21 on the mixed and data-wiped signal, the second coherent
22 processing for providing a further correlated and filtered
23 signal.

29. A system as claimed in claim 28, wherein the means for
performing a mixing and second coherent processing includes a
means for performing a discrete Fourier transform of the mixed
and data-wiped signal followed by an accumulator.

30. A system as claimed in claim 23, wherein the means for
performing a second acquisition of the approximately carrier-
wiped signal comprises:

- a) means for performing a first coherent processing of the
approximately carrier-wiped signal so as to provide a
carrier-amplified signal;
- b) means for performing a data wipeoff using the carrier-
amplified signal so as to provide a data-wiped signal, the
data wipeoff including a squaring or similar operation on
the carrier-amplified signal, thus retaining in the data-
wiped signal, information about the carrier frequency shift
remaining after the first acquisition; and
- c) means for performing a cross correlation of the data-wiped
signal, the cross correlation including estimating the

15 phase and then the correction to the approximately
16 estimated carrier frequency.

1 31. A system as claimed in claim 23, wherein the means for
2 performing a second acquisition of the approximately carrier-
3 wiped signal comprises:

- 4 a) means for performing a common coherent processing of the
5 approximately carrier-wiped signal so as to provide a
6 first-processed approximately carrier-wiped signal;
- 7 b) means for mixing the first-processed approximately carrier-
8 wiped signal with a plurality of sinusoids in turn, each
9 sinusoid at a different frequency in a range of frequencies
10 serving as trial corrections to the approximately estimated
11 carrier frequency determined using the means for performing
12 a first acquisition, so as to provide a mixed signal;
- 13 c) means for performing a first coherent channel processing of
14 the mixed signal so as to provide a carrier-amplified
15 signal;
- 16 d) means for performing a data wipeoff using the carrier-
17 amplified signal so as to provide a data-wiped signal, the
18 data wipeoff including a squaring or similar operation on
19 the carrier-amplified signal, thus retaining in the data-
20 wiped signal, information about the carrier frequency shift
21 remaining after the first acquisition;
- 22 e) means for performing a second coherent channel processing
23 on the data-wiped signal, the second coherent processing
24 for providing a further correlated and filtered signal; and
- 25 f) means for detecting the best value to use for the
26 correction to the approximately estimated carrier frequency
27 based on the further correlated and filtered signal for
28 each different trial frequency correction.

1 32. A system as claimed in claim 23, wherein the first
2 acquisition is a coarse acquisition, and the second acquisition
3 is a fine acquisition.

1 33. A system as claimed in claim 23, wherein the squaring is a
2 complex squaring.

1 34. The system as claimed in claim 23, wherein at least some of
2 the means for performing either all or part of the first
3 acquisition or all or part of the second acquisition are
4 performed by computing facilities external to the receiver, such
5 as by computing facilities that are part of an outside network.

1 35. A method for acquiring a signal having a carrier component
2 at a carrier frequency and a data component, the acquiring
3 including determining the carrier frequency, the method
4 comprising the steps of:

- 5 a) providing a signal including a carrier component and a data
6 component;
7 b) performing an acquisition of the signal, the acquisition
8 including a substep of data wipe-off involving a squaring
9 or similar operation on the provided signal;

10 thereby acquiring the signal to a finer resolution than would be
11 possible without performing a data wipe-off of the data
12 component.

1 36. A method as claimed in claim 35, wherein the step of
2 performing an acquisition of the signal comprises the substeps
3 of:

- a) mixing the signal with a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial estimates of the carrier frequency, so as to provide a mixed signal;
- b) performing a first coherent processing of the mixed signal so as to provide a carrier-amplified signal;
- c) performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency;
- d) performing a second coherent processing of the data-wiped signal, the second coherent processing for providing a further correlated and filtered signal; and
- e) detecting the best value to use for the estimate of the carrier frequency based on the further correlated and filtered signal for each different trial frequency estimate.

37. A method as claimed in claim 35, wherein the step of performing an acquisition of the signal comprises the substeps of:

- a) performing a first coherent processing of the approximately carrier-wiped signal so as to provide a carrier-amplified signal;
- b) performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency; and

c) performing a mixing and second coherent processing, the mixing being performed on the data-wiped signal using a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial estimates of the carrier frequency, to provide a mixed and data-wiped signal, and the second coherent processing being performed on the mixed and data-wiped signal, the second coherent processing for providing a further correlated and filtered signal.

38. A method as claimed in claim 37, wherein in the step of performing a mixing and second coherent processing, the coherent processing includes a discrete Fourier transform of the mixed and data-wiped signal followed by an accumulation.

39. A method as claimed in claim 35, wherein the step of performing an acquisition of the signal comprises the substeps of:

- a) performing a first coherent processing of the approximately carrier-wiped signal so as to provide a carrier-amplified signal;
- b) performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency of the signal; and
- c) performing a cross correlation of the data-wiped signal, the cross correlation including estimating the phase and then the carrier frequency of the signal.

1 40. A method as claimed in claim 35, wherein the step of
2 performing an acquisition of the signal comprises the substeps
3 of:

- 4 a) performing a common coherent processing of the signal so as
5 to provide a first-processed signal;
- 6 b) mixing the first-processed signal with a plurality of
7 sinusoids in turn, each sinusoid at a different frequency
8 in a range of frequencies serving as trial estimates of the
9 carrier frequency, so as to provide a mixed signal;
- 10 c) performing a first coherent channel processing of the mixed
11 signal so as to provide a carrier-amplified signal;
- 12 d) performing a data wipeoff using the carrier-amplified
13 signal so as to provide a data-wiped signal, the data
14 wipeoff including a squaring or similar operation on the
15 carrier-amplified signal, thus retaining in the data-wiped
16 signal, information about the carrier frequency of the
17 signal;
- 18 e) performing a second coherent channel processing on the
19 data-wiped signal, the second coherent processing for
20 providing a further correlated and filtered signal; and
- 21 f) detecting the best value to use for the estimate of the
22 carrier frequency based on the further correlated and
23 filtered signal for each different trial frequency.

1 41. An apparatus for acquiring a signal having a carrier
2 component at a carrier frequency and a data component, the
3 acquiring including determining the carrier frequency, the
4 apparatus comprising:

- 5 a) means for providing a signal including a carrier component
6 and a data component;

7 b) means for performing an acquisition of the signal, the
8 acquisition including means for performing a data wipe-off
9 involving a squaring or similar operation on the provided
10 signal;

11 thereby acquiring the signal to a finer resolution than would be
12 possible without performing a data wipe-off of the data
13 component.

1 42. An apparatus as claimed in claim 41, wherein the means for
2 performing an acquisition of the signal comprises:

3 a) means for mixing the signal with a plurality of sinusoids
4 in turn, each sinusoid at a different frequency in a range
5 of frequencies serving as trial estimates of the carrier
6 frequency, so as to provide a mixed signal;

7 b) means for performing a first coherent processing of the
8 mixed signal so as to provide a carrier-amplified signal;

9 c) means for performing a data wipeoff using the carrier-
10 amplified signal so as to provide a data-wiped signal, the
11 data wipeoff including a squaring or similar operation on
12 the carrier-amplified signal, thus retaining in the data-
13 wiped signal, information about the carrier frequency;

14 d) means for performing a second coherent processing of the
15 data-wiped signal, the second coherent processing for
16 providing a further correlated and filtered signal; and

17 e) means for detecting the best value to use for the estimate
18 of the carrier frequency based on the further correlated
19 and filtered signal for each different trial frequency
20 estimate.

1 43. An apparatus as claimed in claim 41, wherein the means for
2 performing an acquisition of the signal comprises:

- 3 a) means for performing a first coherent processing of the
4 approximately carrier-wiped signal so as to provide a
5 carrier-amplified signal;
- 6 b) means for performing a data wipeoff using the carrier-
7 amplified signal so as to provide a data-wiped signal, the
8 data wipeoff including a squaring or similar operation on
9 the carrier-amplified signal, thus retaining in the data-
10 wiped signal, information about the carrier frequency; and
- 11 c) means for performing a mixing and second coherent
12 processing, the mixing being performed on the data-wiped
13 signal using a plurality of sinusoids in turn, each
14 sinusoid at a different frequency in a range of frequencies
15 serving as trial estimates of the carrier frequency, to
16 provide a mixed and data-wiped signal, and the second
17 coherent processing being performed on the mixed and data-
18 wiped signal, the second coherent processing for providing
19 a further correlated and filtered signal.

20
21 44. An apparatus as claimed in claim 43, wherein the means for
22 performing a mixing and second coherent processing includes
23 means for performing a discrete Fourier transform of the mixed
24 and data-wiped signal followed by an accumulation.

25
26 45. An apparatus as claimed in claim 41, wherein the means for
27 performing an acquisition of the signal comprises:

- 28 a) means for performing a first coherent processing of the
29 approximately carrier-wiped signal so as to provide a
30 carrier-amplified signal;
- 31 b) means for performing a data wipeoff using the carrier-
32 amplified signal so as to provide a data-wiped signal, the
33 data wipeoff including a squaring or similar operation on

9 the carrier-amplified signal, thus retaining in the data-
10 wiped signal, information about the carrier frequency of
11 the signal; and

- 12 c) means for performing a cross correlation of the data-wiped
13 signal, the cross correlation including estimating the
14 phase and then the carrier frequency of the signal.

1 46. An apparatus as claimed in claim 41, wherein the means for
2 performing an acquisition of the signal comprises:

- 3 a) means for performing a common coherent processing of the
4 signal so as to provide a first-processed signal;
5 b) means for mixing the first-processed signal with a
6 plurality of sinusoids in turn, each sinusoid at a
7 different frequency in a range of frequencies serving as
8 trial estimates of the carrier frequency, so as to provide
9 a mixed signal;
10 c) means for performing a first coherent channel processing of
11 the mixed signal so as to provide a carrier-amplified
12 signal;
13 d) means for performing a data wipeoff using the carrier-
14 amplified signal so as to provide a data-wiped signal, the
15 data wipeoff including a squaring or similar operation on
16 the carrier-amplified signal, thus retaining in the data-
17 wiped signal, information about the carrier frequency of
18 the signal;
19 e) means for performing a second coherent channel processing
20 on the data-wiped signal, the second coherent processing
21 for providing a further correlated and filtered signal; and

f) means for detecting the best value to use for the estimate of the carrier frequency based on the further correlated and filtered signal for each different trial frequency.

47. A system for acquiring a signal having a carrier component at a carrier frequency and a data component, the acquiring including determining the carrier frequency, the system comprising:

- a) a receiver, for receiving the signal as a sequence of samples, for providing a received signal including a carrier component and a data component;
- b) means for performing an acquisition of the signal, the acquisition including means for performing a data wipe-off involving a squaring or similar operation on the received signal;

thereby acquiring the signal to a finer resolution than would be possible without performing a data wipe-off of the data component.

48. A system as claimed in claim 47, wherein the means for performing an acquisition of the signal comprises:

- a) means for mixing the signal with a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial estimates of the carrier frequency, so as to provide a mixed signal;
- b) means for performing a first coherent processing of the mixed signal so as to provide a carrier-amplified signal;
- c) means for performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on

the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency;

- d) means for performing a second coherent processing of the data-wiped signal, the second coherent processing for providing a further correlated and filtered signal; and
- e) means for detecting the best value to use for the estimate of the carrier frequency based on the further correlated and filtered signal for each different trial frequency estimate.

49. A system as claimed in claim 47, wherein the means for performing an acquisition of the signal comprises:

- a) means for performing a first coherent processing of the approximately carrier-wiped signal so as to provide a carrier-amplified signal;
- b) means for performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency; and
- c) means for performing a mixing and second coherent processing, the mixing being performed on the data-wiped signal using a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial estimates of the carrier frequency, to provide a mixed and data-wiped signal, and the second coherent processing being performed on the mixed and data-wiped signal, the second coherent processing for providing a further correlated and filtered signal.

50. A system as claimed in claim 43, wherein the means for

performing a mixing and second coherent processing includes means for performing a discrete Fourier transform of the mixed and data-wiped signal followed by an accumulation.

51. A system as claimed in claim 47, wherein the means for performing an acquisition of the signal comprises:

- a) means for performing a first coherent processing of the approximately carrier-wiped signal so as to provide a carrier-amplified signal;
- b) means for performing a data wipeoff using the carrier-amplified signal so as to provide a data-wiped signal, the data wipeoff including a squaring or similar operation on the carrier-amplified signal, thus retaining in the data-wiped signal, information about the carrier frequency of the signal; and
- c) means for performing a cross correlation of the data-wiped signal, the cross correlation including estimating the phase and then the carrier frequency of the signal.

52. A system as claimed in claim 47, wherein the means for performing an acquisition of the signal comprises:

- a) means for performing a common coherent processing of the signal so as to provide a first-processed signal;
- b) means for mixing the first-processed signal with a plurality of sinusoids in turn, each sinusoid at a different frequency in a range of frequencies serving as trial estimates of the carrier frequency, so as to provide a mixed signal;
- c) means for performing a first coherent channel processing of the mixed signal so as to provide a carrier-amplified signal;

- 13 d) means for performing a data wipeoff using the carrier-
14 amplified signal so as to provide a data-wiped signal, the
15 data wipeoff including a squaring or similar operation on
16 the carrier-amplified signal, thus retaining in the data-
17 wiped signal, information about the carrier frequency of
18 the signal;
- 19 e) means for performing a second coherent channel processing
20 on the data-wiped signal, the second coherent processing
21 for providing a further correlated and filtered signal; and
- 22 f) means for detecting the best value to use for the estimate
23 of the carrier frequency based on the further correlated
24 and filtered signal for each different trial frequency.